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S P E C I F I C A T I O N

To All Whom It May Concern:

Be It Known That I, Harvey M. Ross, a citizen of the United States, resident of the County of St. Louis, State of Missouri, whose full post office address is 787 Cross Creek Drive, St. Louis, Missouri 63141 have invented certain new and useful improvements in

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SYSTEM AND METHOD OF MANUFACTURING A SINGLE BOOK COPY

Background of the Invention

This invention relates to the field of book distribution manufacturing and retailing; however, while most book manufacturing is accomplished by the production of a large quantity of copies of the same book at one time in a factory setting, the present invention involves a computer-based system for the high speed reproduction of a single copy of a selected book, preferably at the consumer point of purchase.

The distribution of books to consumers is usually accomplished through retail stores and mail order catalogue concerns which purchase multiple copies of thousands of different book titles for resale. In a typical retail book store, the major expenses of doing business are rental of retail store space, employee wages and benefits, and inventory maintenance costs including interest on loans and economic losses created by shoplifting, employee pilferage, damage to inventory from customer handling and those costs incurred by unwanted unsaleable inventory. Further costs include those of physically shipping and handling of books from the manufacturer to the retail store. The retail store owner must always attempt the impossible task of accurately predicting future demand for the myriad of books on the market; while the consumer may be frustrated in trying to find a particular book which because of its age or the nature of its subject matter does not provide enough public demand for the

retailer to invest his money or space to carry the book in inventory. A system of ordering such books is available through retail stores; however, the customer must wait usually days to procure a book by this method and sometimes the book may not even be in print and thus unavailable.

Similar problems which exist in the retail sales of records and tapes were addressed in U.S. Patent No. 4,811,325 where a system is disclosed for producing a customized sound recording in a retail environment while the customer waits. While the problems which exist regarding the retailing of sound recordings are similar to those regarding books, the subject matter of the cited patent does not lend itself to improving the above-identified difficulties relating to the sales of books.

Summary of the Invention

The present invention comprises a computer based book manufacturing system for the high speed reproduction of a single copy of a book. The system may be utilized in many environments, but it is especially well suited for direct retail consumer sales. The system includes the capability of computer storage of tens of thousands of different books, both the printed text and color graphic cover thereof, along with both textual and color pictorial promotional sales information regarding each of the stored books. A computer module permits the consumer to access the promotional sales information on a display screen which may

include general information such as a list of best sellers or specific information about individual books in which the consumer may have some interest. Such promotional information may include a picture of the book, descriptive information provided by the publisher, as well as a synopsis and critique of the book by a book reviewer. The consumer may browse through the pages of the book on the computer module screen. If the consumer wishes to purchase a book, he may either pay for the book through a store clerk who will command the system to manufacture a single copy of the book; or the consumer may enter his credit card into the system, and after the purchase transaction is automatically approved and logged through the public telephone network, the system will automatically initiate production of the book.

Upon command, the computer will retrieve the text data from its memory and command the high speed printing of the text pages of the book, preferably precisely in the same format as the original publishers printing. At nearly the same time the computer will retrieve the color graphic data from computer storage for printing of the book cover on a color printer/plotter. After printing, the printed pages are automatically transferred first to a jogger table for alignment of the text pages, then to a paper cutter for cutting the pages down to the proper size for the particular book, next to an automatic thermal binding machine where the text pages are bound

into the color book cover. Of course, the pages could be cut prior to alignment if desired. Lastly, the finished book is conveyed to a pick-up tray where the customer has been awaiting the arrival of his book for about three to five minutes.

The present invention may aid in the operation of, for example, public libraries. At present, public libraries must utilize large, expensive buildings to house a vast multitude of costly books, a great number of which are rarely read by the library's constituency. The high speed manufacturing system of the present invention could provide computer browsing capabilities for library users and facilitate physical delivery of a particular book to the user for check-out in an overall cheaper scheme than conventional library systems.

Many advantages become readily apparent when the manufacturing system of the present invention is placed in a university book store environment. For example, the machine could produce only the books necessary for the number of students enrolled in a particular class and only those books which the professor has designated for the particular course. As these factors are quickly changeable, the present invention could efficiently provide the correct books and precisely the quantity necessary in an efficient, cost-effective manner.

Also, it is contemplated that systems located in

different stores and University libraries could provide further library texts to each other through telephone communication thereby expanding the number of titles available to an even greater extent.

The floor space required for the book manufacturing system according to the invention is somewhat larger than an ordinary office desk plus a computer customer console for each customer sales location or booth; about thirty square feet of floor space. It contemplated that one to four such customer console would be desirable.

Briefly stated, the present invention is a book manufacturing system comprising computer means for storing and selectively retrieving data corresponding to the text of and information concerning a plurality of books. The system includes means for the consumer to select one of the books and, automatically cause the book to be printed and bound while the consumer waits.

It is therefore an object of the invention to provide a book manufacturing system which is capable of storing data corresponding to the text and color graphical cover of tens of thousands of different books, as well as promotional sales text and color graphics for aiding the consumer in choosing a book for purchase, and facilitate the high speed manufacture of a single copy of a selected book on the immediate premises while the customer waits for a very short time.

It is another object of the invention to provide a system which alleviates or even eliminates the problems set forth above associated with the need to purchase and hold a large inventory of books for a retail store or mail order catalogue concern, to reduce floor space requirements, to provide for reduction of the number of employees needed to run a retail book store, to provide for the reduction of shoplifting costs, employee pilferage costs, damage to inventory and dead inventory costs as well as shipping costs associated with the operation of a retail book store.

It is a further object of the invention to provide a system which enhances the consumer's chances of finding and procuring a book which may not otherwise be available.

These as well as other objects and advantages of the present invention will become more apparent upon a reading of the following description of a preferred embodiment thereof.

Brief Description of the Drawings

In the drawings:

FIG. 1 is a system block diagram of the single copy, high speed book manufacturing system according to the preferred embodiment of the invention; and

FIG. 2 is a semi-schematic representation of the physical design of a preferred embodiment of the invention.

Description of A Preferred Embodiment

With reference to the drawings, there is shown a preferred embodiment of a book manufacturing system according to

the principles of the present invention. While FIG. 1 shows in diaphragmatic form the flow of information and materials through the system, and FIG. 2 shows a schematic representation of the physical nature of the system, like reference characters will indicate like features of the invention in both of the figures, wherein the preferred form of the book manufacturing system is represented generally by the numeral 10.

System 10 is comprised of three main subsystems, viz, the master command module 12, the customer module 14 and the finishing module 16.

Master command module 12 is comprised of a master microcomputer 18 equipped with an integral hard magnetic disk drive of preferably not less than 40 MBytes for the storage of application software, utility software and diagnostic software. Master microcomputer 18 also preferably includes an integral drive for 1.44 MByte, 3.5" magnetic diskettes employed for running these programs, including the loading and maintenance of the text of the books to be included in the book machine library. Controllers are provided for the integral disk drives. Optical disk drives 20 are provided in communication with master microcomputer 18.

Optical disk drives 20 preferably includes a multiple of optical storage disks that employ ISO - standard 5.25" optical cartridges with a storage capacity (formatted) of not less than

650 MBytes per cartridge, and a data transfer rate of not less than 700 MBytes per second for the storage of machine library titles, text, promotional descriptive data and cover color graphics. In accordance with this invention, other storage media and retrieval systems may be used.

Also in communication with microcomputer 18 is a clerk console display screen 22 which is provided with both computer display and touch sensor screen capabilities. Clerk console 22 preferably includes a computer screen with a diagonal receiving measurement of not less than 12" and a display resolution of 640 x 350 picture elements (pixels). The touch sensor integrated with the clerk computer screen has a resolution of not less than 1 part in 1024 and a diagonal measurement of not less than 12".

Master microcomputer 18 may transmit and receive data transmissions via modem 24 through the public telephone network to receive data corresponding to the text and cover graphics of an additional book or books not yet in the machine library. Further, credit card transactions can automatically and instantly be consummated and recorded through the telephone network as is well known in the art.

Master microcomputer 18 also communicates with a page printer 26 and a color printer/plotter 28. Page printer 26 is comprised of a number of non-impact laser printers capable of printing, upon command by microcomputer 18, on both sides of

paper loaded therein, the entire text of a book to produce the paper pages thereof. The use of multiple low speed printers allows the machine to accomplish its task in the event that one printer should fail during the printing process. The page printer 26 preferably provides a resolution of not less than 0.085 mm, a printing speed of not less than 20 duplex impressions per minute on paper sizes of 8 1/2" x 11"; 8 1/2" x 14", and 11" x 17" with weights of 17 lb. to 21 lb. bond, with a parallel data and serial data communications interface.

Color printer/plotter 28 is adapted to produce a pictorial color cover upon command by microcomputer 18, and is comprised preferably of a multiple color printer/plotter with a dot resolution of 0.085mm., on paper, vellum and poly film; and includes a parallel data interface.

Customer module 14 includes a data management unit 30 being provided with a microcomputer 32 and a plurality of optical disk drives 34 in communication therewith, preferably one to four customer consoles 36 and a credit card reader 38 for each console. Microcomputer 32 is equipped with an integral hard magnetic disk drive preferably of not less than about 40 MBytes for the storage of application software and customer assistance text; an integral drive, for example, for 3.5", 1.44 MByte magnetic diskettes for application program loading and data backup functions; controllers for the integral disk drives; a

controller for the optical disk drives 34; and communications interfaces with master control module 12 and customer consoles 36. Optical disk drives 34 are erasable and employ ISO-standard 5.25" optical cartridges with a storage capacity (formatted) of not less than 650 MBytes per cartridge, and a data transfer rate of 700 KBytes per second for the storage of library indexes, library titles, color graphic data and promotional sales descriptive data.

Customer consoles 36 are preferably provided with a customer seat and an ambient light level suitable for viewing the color computer monitor screen 40. Color computer monitor screen 40 is preferably not less than 14" of diagonal viewing area with a maximum resolution of 1024 x 768 pixels, and includes a touch sensor integrated with the monitor having a resolution of 1 part in 1024 and a diagonal measurement of not less than 14". Each customer console 36 also includes a microcomputer 42 which includes controllers for the color screen monitor 40 and the touch sensor therewith, an interface with the data management unit 30 and a memory unit in which resides the customer application software.

Finishing module 16 includes a jogger table 50 for aligning the paper pages stack, a parallel paper cutter 52 for cutting the text paper pages into the required size for any particular book in the machine library, a thermal binder 54 for

binding the text pages together with a spine and the color cover therearound, and a delivery tray 56 to which the finished book is conveyed for pick-up by the customer.

The application software for the master microcomputer 18 which resides in the integral hard magnetic disk creates labeled touch pads on the clerk console screen, identifies and locates the coordinates of a finger pressure on the touch sensor of clerk console 22 and translates the coordinates into commands that provide for (a) adding new book titles, text and descriptive material data to the optical disks 20 and transferring subsets of this data to the customer module data management unit microcomputer 32 for transfer to the data management storage disks 34; (b) executing and summarizing purchase transactions from credit card reader 38 or clerk console 22 and preparing periodic reports; (c) generating daily reports for publisher royalties; and (d) conducting system health diagnostics on all active elements of the system and displaying the results of these checks on the clerk's console screen.

The application software for the data management unit microcomputer 32 provides for (a) the receipt and execution of commands received from customer console microcomputer 42; (b) the retrieval of book titles, graphics and descriptive data from storage in optical disks 20 in response to commands, and the transfer of same to optical disk 34; (c) the transfer of purchase

commands to master microcomputer 18; and (d) the execution of diagnostic commands and the transfer of system messages to master microcomputer 18.

The application software for the customer console microcomputer 42, (a) creates labeled touch pads on customer console computer screen 40; (b) identifies and locates the coordinates of a finger pressure on the touch sensor and translates the coordinates into customer commands; (c) transfers commands to data management unit microcomputer 32 and receives commands and data, such as book lists, book text, sales promotional information and graphics, etc., and (d) interprets commands and displays information on color computer display 40 .

OPERATION

Book manufacturing system 10 employs three major steps for operation: (a) Initial preparation and storage of source data; (b) process for customer browsing and purchase selection; and (c) physical printing and assembly of selected book.

DATA PREPARATION

The book data that is employed by the system is comprised of three elements: (a) the textual contents of the book, (i.e., text pages, index page, table of contents, Library of Congress notice, fly sheets, etc.); (b) descriptive material such as a synopsis, plot outline, author's biographical summary, etc., (i.e., those textual materials that are promotional in nature); and (c) color cover graphics.

The source of this data will usually be the publisher of the book, and each book is first translated from its source media to a specified format for recording on 3.5", 1.44 MByte diskettes. One diskette stores up to 450 pages of textual material. A companion diskette stores cover graphics data in a compressed format and a minimum of 10 pages of descriptive text.

The system employs optical storage cartridges 20 as its data source, and initially the library of books that the publisher or system owner wishes to be made available to the system must be transferred from magnetic to optical media. This is accomplished by employing stand alone subsets of the master control module hardware and software to read/verify the diskette data, compress the textual and graphics data, and write/verify the optical data. Each optical storage cartridge has the capability of storing up to 1,140 sets of textual, graphics and descriptive data; there are built-in provisions for up to five (5) additional optical disk drives to be installed thus providing an on-line book capacity of 7,840 books. The total system capacity is limited only by the number of optical disks required for a given store. The additional optical disk would require operator loading.

Additions to the existing storage library are shipped to system owners via magnetic media or, alternatively, over the telephone modem, and transferred to the appropriate optical storage cartridge by the master control module utility program.

When updating by magnetic media in the form of two diskettes, the clerk touches a 'manual update' command block displayed on the clerk's console screen 22. The utility program then causes data to be displayed instructing the clerk as to which optical disk cartridge to load into disk drive 20, the order in which the diskettes are to be loaded, and the command blocks to be touched in order to verify the integrity of the data transfer from each diskette. Software interlocks ensure the correct sequencing of commands and maintain the integrity of the stored data. The diskettes can be retained for backup purposes.

In the event that updates are transferred via telephone modem 24, the utility program routes each update transfer block (2.88 MBytes) to an area of the integral hard magnetic disk in microcomputer 18 specifically reserved for this function. The utility program then causes data to be displayed instructing the clerk as to which optical disk cartridge to load into optical drive 20 and the command blocks to be touched in order to verify the integrity of the data transferred from the hard disk, it is compressed and transferred to the optical disk. Following transfer to the optical disk, the clerk will be instructed via the computer screen 22 to insert two blank diskettes (for data backup recording purposes) in a specific sequence and to actuate labeled command blocks when each block transfer is complete. Software interlocks ensure the correct sequencing of commands and

maintain the integrity of the stored data. This sequence is repeated for all data that was transferred via the modem, following which the reserved area of the hard disk is erased.

Upon initial system loading of the library cartridges 20 and of subsequent additions, utility software in the master microcomputer 18 creates an index by author and title of all books available in the system, and copies the descriptive material of each book, together with a low-resolution subset of its cover graphics to the optical storage unit 34 of the data management unit 30 of customer module 14, to provide a graphic and descriptive index of not less than about 4000 books per cartridge drive. There can be built-in provisions for a total of up to six drives to be installed, providing a total capacity of customer review material of about 24,000 books per system.

CUSTOMER SELECTION

All customer actions are conducted within customer console 36. The customer seats him or herself in front of computer screen 40 which initially displays a preprogrammed graphics and text message selected by the system owner and invites the customer to touch any part of the screen to initiate the dialogue. For all subsequent customer/system interchanges, the screen will display a series of labeled vertically-oriented command boxes on the right side of the screen, with requested data and graphics being presented in the remaining area of the

screen. A "help" command block will be present on each transaction screen to assist the customer in accessing the system, and all text display formats include a touch 'dragging' feature that enables the customer to browse forward and backward through the displayed text at his own pace. A visual feedback is made to each touch and a double tap will "undo" the selection. The transactions available to the customer include, but are not limited to: (a) display of current best sellers, with selection resulting in a display of the book; (b) searching by title or author, with selection resulting in a display of the book; (c) browsing through descriptive material provided by the publisher; (d) making another selection; and (e) requesting purchase of a book.

Each customer console 36 is a stand alone unit with local storage and is a node on a high-speed data network for access to the data management unit 30 for graphic and descriptive data and for requesting a purchase. Application software within data management unit 30 retrieves the graphic or descriptive data requested by a customer console, decompresses the data and routes the data to the requestor. Library integrity is maintained by operating the optical storage unit in a read-only mode and by the interlocking of command software such that only logical command sequences are accepted.

Following a purchase command, the customer is advised of the waiting time for delivery of the finished book which usually will be three to five minutes. Applications software maintains track of printing status and advises individual customer consoles of the expected time of book delivery.

PRODUCT DELIVERY

A purchase request from customer module 14 results in the clerk being notified by a screen message of the optical storage cartridge to be loaded. This loading may be accomplished automatically within the master command module 12 or manually by the clerk. Following this action, the clerk may be requested to verify the status of printer 26 in terms of paper availability, toner levels, etc., and to load the book cover material into color printer/plotter 28. It is contemplated that this step may also be accomplished fully automatically. Upon cash payment by the customer at the clerks station, or upon credit card payment and verification through credit card reader 38, printing and plotting are initiated.

The applications software resident in the master command microcomputer 18 accepts a purchase command from the customer module, checks printer status and returns a message to the requestor of anticipated delivery time. The purchase command includes title data that is used to format a display to the clerk's screen identifying the optical cartridge to be mounted

either automatically or manually. Data is then retrieved from optical disk 20, data is decompressed and routed to printer/plotter 28, and text data is decompressed, ordered and formatted for double page/double side printing and routed to printer 26.

On completion of the printing/plotting operation master microcomputer 18 is signaled and it commands a conveyor to transfer the collated stack of paper text pages to jogger table 50 to achieve paper alignment, then to paper cutter 52 for reduction of the size of the paper to the desired dimension for the particular book and thence on to thermal binder 54 where the paper stack is clamped. The finished cover sheet is transferred from printer/plotter 28 to binder 54 where a binding spine is carried across a glue cylinder to the paper pages and the cover sheet is creased around the pages and the spine to achieve a finished book. The book is then conveyed out of finishing module 16 via delivery tray 56 for pickup by the customer.

Within the broader aspects of this invention, those skilled in the art will recognize that, depending on the type of printing operation and blank paper used, the above-described jogging and paper trimming operations may not be required.

The computer-related hardware components of the present invention are readily available. In order to aid one of ordinary skill in the art in the production and practice of the novel

system, the following list of specific possible hardware components is provided; however, it should be understood that the list provides only examples of available hardware, and the characteristics of the particular hardware cited do not limit the scope of the present invention.

CUSTOMER MODULE (14)

Customer Console (36)

Computer Display (40) - 16" 1280x1024 pixel high resolution video monitor similar to a Mitsubishi 16L Diamond Scan, equipped with a touchscreen similar to an Elographics AccuTouch resistive sensor.

Microcomputer (42) - Intel 286-based microprocessor configured as a diskless node on a LAN network with 4 megabytes of high speed random access memory, a CVGA graphics adapter card and a touchscreen serial controller similar to a CompuAdd model 64772 212w Arcnet-linked diskless workstation with 4 megabyte option and an Elographics 274-150 RS232 controller card.

Data Management Unit (30)

Microcomputer (32) -Intel 386-based 25 Mhz microprocessor configured with 16 megabytes of RAM memory, an Intel 80387-25 math coprocessor, an 80 megabyte (19 millisecond access) hard disk drive, a 1.44

megabyte diskette drive, dual disk controllers, LAN network controller card and optical disk controller cards similar to CompuAdd model 64837 with 16 megabyte option, 80837-25 coprocessor option, Arcnet 8-port active hub, and optical disk controller card(s).

Optical Disks (34) -ISO-standard read/write option storage system expandible in 650/1300 megabyte storage increments similar to the Alphatronix Inspire model IPA20-D.

MASTER COMMAND MODULE (12)

Clerk Console (22)-14" 640x350 pixel medium-resolution monochrome video monitor similar to a Mitsubishi Diamond Scan, equipped with a touchscreen similar to an Elographics AccuTouch resistive sensor.

Master Microcomputer (18) - Intel 386-based 25 Mhz microprocesor configured as a LAN network node, with 16 megabytes of RAM memory, an Intel 80387-25 math coprocessor, a 320 megabyte (18 millisecond access) hard disk drive, a 1.44 megabyte diskette drive, dual disk controllers, LAN network controller card and optical disk controller cards similar to CompuAdd model 64839

with 16 megabyte option, 80837-25 coprocessor option. Arcnet 8-port passive hub, printer controller, color printer/plotter controller, Modem (24) - Bell 212, CCITT V.32 compatible full duplex 9600 baud add-in modem similar to Black Box Model TK-MD909-C and optical disk controller card(s).

Optical Disks (20) - ISO-standard read/write optical storage system expandible in 650/1300 megabyte storage increments similar to the Alphatronix Inspire model IPA20-D.

Page Printer (26) - one or more Adobe PostScript compatible laser printers with duplex printer capabilities configured to provide an aggregate printing rate of not less than 20 impressions/minute similar to 3 or more Hewlett-Packard LaserJet Series IID.

Color Printer/Plotter (28) - 300 dpi, 8 color pen printer/plotter similar to Hewlett-Packard 7475A, or alternative Toyo TPG 4300 full color video printer.

FINISHING MODULE (16)

Thermal Binder (54) - semiautomatic binding machine

employing the hot glue process and incorporating jogging, clamping, cover sheet forming and glueing mechanisms similar to the PLANAX Autotherm IIIS.

It will be readily apparent to one skilled in the art that numerous modifications may be made to the preferred embodiment of the invention as described hereinabove without departing from the spirit and scope of the present invention.